Name:____ Date:____________________

Polynomial Operations SOLUTION (version 147)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = -2x^5 + 9x^3 - 3x^2 - 6x + 7$$

$$q(x) = 7x^5 - x^4 - 2x^3 + 6x - 4$$

Express the difference $p(x) - q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) - q(x)$ with addition/subtraction.

$$\begin{aligned} p(x) &= (-2)x^5 + (0)x^4 + (9)x^3 + (-3)x^2 + (-6)x^1 + (7)x^0 \\ q(x) &= (7)x^5 + (-1)x^4 + (-2)x^3 + (0)x^2 + (6)x^1 + (-4)x^0 \\ p(x) - q(x) &= (-9)x^5 + (1)x^4 + (11)x^3 + (-3)x^2 + (-12)x^1 + (11)x^0 \\ p(x) - q(x) &= -9x^5 + x^4 + 11x^3 - 3x^2 - 12x + 11 \end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = -6x^2 - 5x - 7$$

$$b(x) = -2x - 9$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$-6x^2$	$-5x$	-7
$-2x$	$12x^3$	$10x^2$	$14x$
-9	$54x^2$	$45x$	63

$$a(x) \cdot b(x) = 12x^3 + 10x^2 + 54x^2 + 14x + 45x + 63$$

Combine like terms.

$$a(x) \cdot b(x) = 12x^3 + 64x^2 + 59x + 63$$

3. Express $(x + 1)^6$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$$

Polynomial Operations SOLUTION (version 147)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -3x^3 - 23x^2 + 6x - 10 \\ g(x) &= x + 8 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x+8}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

$$\begin{array}{c|cccc} & -3 & -23 & 6 & -10 \\ -8 & & 24 & -8 & 16 \\ \hline & -3 & 1 & -2 & 6 \end{array}$$

So,

$$\frac{f(x)}{g(x)} = -3x^2 + x - 2 + \frac{6}{x+8}$$

In other words, $h(x) = -3x^2 + x - 2$ and the remainder is $R = 6$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -3x^3 - 23x^2 + 6x - 10$. Evaluate $f(-8)$.

You could do this the hard way.

$$\begin{aligned} f(-8) &= (-3)\cdot(-8)^3 \ + \ (-23)\cdot(-8)^2 \ + \ (6)\cdot(-8) \ + \ (-10) \\ &= (-3)\cdot(-512) \ + \ (-23)\cdot(64) \ + \ (6)\cdot(-8) \ + \ (-10) \\ &= (1536) \ + \ (-1472) \ + \ (-48) \ + \ (-10) \\ &= 6 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(-8)$ equals the remainder when $f(x)$ is divided by $x+8$. Thus, $f(-8) = 6$.